

FIR Detectors/Cameras Based on GaN and Si Field-Effect Devices, Phase I

Completed Technology Project (2009 - 2009)



Project Introduction

SETI proposes to develop GaN and Si based multicolor FIR/THz cameras with detector elements and readout, signal processing electronics integrated on a single chip. The active detector elements will be submicron gated channels with 2 dimensional electron gas (2DEG). The devices with gated 2DEG (commonly known as field-effect transistors) respond to the incoming FIR radiation due to the rectification of radiation induced oscillations of electron density (electron plasma). Phase I of the project will be devoted to the development, design, and characterization of the single pixel, consisting of an array of field-effect transistors, targeting at responsivity increase of 100 times, and demonstrating the technical feasibility of 10^{10} cm Hz^{0.5}/W detectivity.

Anticipated Benefits

Our proposed FIR camera is also suitable for study of upper Earth atmosphere, such as mapping the famous ozone holes. The potential applications of the THz waves (radiation with the wave lengths from 1 mm to 10 μ m) also include detection and identification of harmful biological and chemical agents, explosives, biomedical imaging, defectoscopy, and Earth atmosphere exploration. We develop detectors for far infrared (FIR) range which provides information on emissions from cold dust, molecular clouds, and contains the cold space background, usually referred to as the relict radiation (2.783 0.025 K). The specific signatures in the FIR spectral range provide the information on temperature, pressure and velocities of the gases involved; in other word, the essential information, valuable for modern theories of star and galaxies formation and evolution. Our plasma wave approach will provide superior advantages over commercial FIR/THz cameras on cost, speed, resolution, and sensitivity performance.



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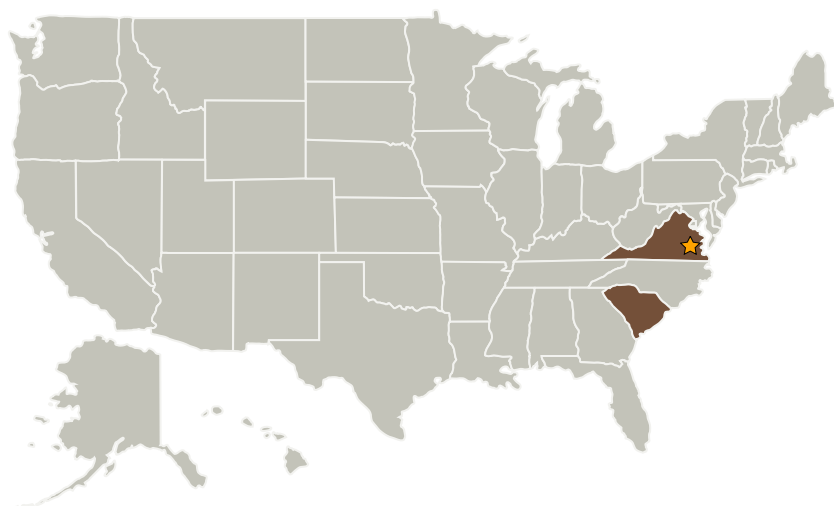
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Sensor Electronic Technology, Inc.	Supporting Organization	Industry	Columbia, South Carolina

Primary U.S. Work Locations

South Carolina	Virginia
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Nurul Abedin

Principal Investigator:

Jianyu Deng

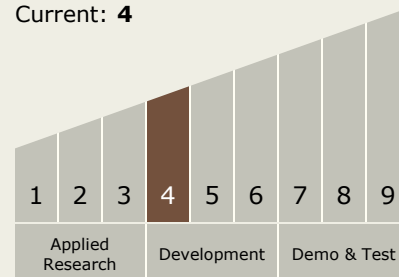
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Technology Maturity (TRL)

Start: 4
Current: 4



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes